THE AERONAUTICAL JOURNAL.

OCTOBER, 1901.

The Aeronautical Journal.

(PUBLISHED QUARTERLY.)

SUBSCRIPTION PER ANNUM (post free), 4s.

Communications respecting Advertisements to be addressed to the Publishers, "Aeronautical Journal,"

Messrs. KING, SELL & OLDING, Ltd., 4, Bolt Court, 12, Gough Square, and 4, Birchin Lane, E.C.

Editorial communications should be addressed to the Editor,

19, Campden House Road, Kensington, London, W.

NOTICES OF The Aeronautical Society.

At a meeting of the Council held at the Society of Arts on Monday, July 15th, 1901, the following gentlemen were elected members of the Society:—

Commander ROBERT FALCON SCOTT, R.N.
Mr. E. DOUGLAS ARCHIBALD, M.A.
Mr. HENRY GUY BUTT.

Resolved, that New Rule VI., which provided for the admission of Associate Members at an annual subscription of five shillings, should be rescinded.

ERIC STUART BRUCE,
Honorary Secretary.

GENERAL MEETING.

A General Meeting of the Aeronautical Society of Great Britain was held at the Society of Arts on Monday, July 15th, 1901. Major H. C. Roberts occupied the Chair.

The CHAIRMAN: Ladies and Gentlemen,—We propose to commence the proceedings of this evening by asking our Honorary Secretary, Mr. Eric Stuart Bruce to read the Minutes of the Meeting of the Council which took place on the 15th of April last.

The SECRETARY read the Minutes.

The CHAIRMAN: I take this opportunity of asking you to thank, in the name of the Meeting, Mr. Alexander, for his most generous gift. Our Society has never been very much on the right side. I can remember a few years ago, that we had to the good the sum of 4s. 6d. only. Now we find, thanks partly to Mr. Alexander's offer and to the number of new members who have joined us that we have, within a few pence, £150 to the good. (Cheers.) Mr. Bruce will now read a general statement regarding the Society.

MR. ERIC STUART BRUCE: It is usual for the Honorary Secretary of the Aeronautical Society from time to time at General Meetings to make a few remarks concerning the work of the Society. The great object of the Aeronautical Society is the navigation of the air, whether it is to be accomplished by the body lighter than air, the body heavier than air, or by a combination of both balloon and flying machine. But even supposing that its prime object is never completely realised, which the aeronaut will not allow, for he exclaims with the Latin poet "nil mortalibus arduum est," (nothing is too hard for man); yet apart from the question of complete mastery of the air there is, I think, sufficient work before our Society to justify its existence, and the support of the public. The application of aeronautics to pure scientific research is another object of our Society. This object alone is destined to give our Society an importance in the scientific world, which it would be difficult to over estimate. For does not this object link it with nearly all other scientific societies? Aeronautics alone can sever the bond of

gravity which chains the observer of every science to the surface of our planet, and places him in new conditions of observation, which must tend to enlarge his conceptions and increase his knowledge.

It would be possible to give a long discourse on the advantages of systematic scientific research in the car of a balloon, to the chemist, physicist, physiologist, and astronomer; but I will confine my remarks to its advantage to the meteorologist.

Nearly all our present meteorological knowledge has been acquired on the surface of the earth amidst those disturbing influences which militate against precise and definite knowledge. Aeronautics can give the meteorologist insight into the meteorology of the free air, that is true meteorology. In this application of aeronautics a splendid field of research will open out before the aerial explorer. What do we yet know about aerial currents, those possible natural air-routes? How long in advance can we now successfully forecast the weather? Is not the weather a series of surprises? Would it be so if we had more definite knowledge concerning the great laws which regulate the cyclonic and anti-cyclonic conditions. Aeronautics and meteorology are, therefore, most essentially united. It might, perhaps, be well if the organisation of systematic aerial meteorological research was undertaken jointly by the two societies, which represent aeronautics and meteorology. For the successful carrying out of aerial experiments, such an organisation would need: (1) the sinews of experiments—ample funds. (2) the co-operation of the meteorological observers in their several departments. Concerning the former, I do not feel doubtful that if an aerial research fund was once well started it would receive an equal amount of public support, as the liquefaction of gases or Arctic exploration.

To-day we have before us an example of the generosity of one of our own members in the service of aeronautics.

Against systematic research in balloons in this country, it will be urged that such a system of research is not fitted for Great Britain, as the balloon is in constant danger of being wafted out to sea beyond our Islands. But in this imperial moment, is Great Britain any longer an island? Is there not now a Greater Britain, containing many lands, each larger than half the European Continent? We have, therefore, a choice of many climates in determining which is best suited to the requirements of aerial research.

After all, is it impossible to obtain good results even in our breezy islands? Was not the recognised highest ascent undertaken and successfully carried out by Mr. Glaisher, from England. Coxwell, the great aeronaut, who piloted Mr. Glaisher, knew full well that for such a high ascent, our insular position was a difficulty; but in the words of Lord Lyndhurst, he also knew that a difficulty is "something to be overcome." He knew that in attention to small detail there is almost magic power, and on foresight in his preparations he relied for the success attained. It will be generally admitted that for scientific ascents in this country, an important needed improvement in the balloon is the better control of its vertical movements. Therefore, the experiment contemplated by Dr. Barton (one of the members of our Society), of building an airship, one of the principal features of which will be the control of its vertical movements, will be looked forward to with the most intense interest by the aeronauts of every nationality.

The CHAIRMAN: We now propose to exhibit by means of the lantern, a special series of photographs representing the British War Balloon Operations in South Africa, which were taken on the spot.

The photographs were then exhibited.

MR. ERIC STUART BRUCE: In exhibiting these photographs we can say with truth that the War in South Africa has afforded the greatest object-lesson on record of the use of the balloon in warfare, and that it has shown that we possess the finest Military Balloon equipment in the world. (Cheers.) As I see that we are honoured by the presence of Colonel Templer, I should like Colonel Templer to say which he considered to be the chief positions of utility in the balloon operations in South Africa.

Col. TEMPLER: Ladies and Gentlemen,—I am sure anything I can tell you will be a great pleasure to me. Perhaps I might mention that the second balloon section went to Ladysmith, and got up just in front of the sailors whom you heard so much about. They had to go, of course, very urgently and quickly from the base, and so only a part of the detachment went on and got into Ladysmith just before they were besieged. I was not there myself, but the observations were carried out for them as long as the balloon and gas would last, which was about 29 days. Sir George White told me when he came out that I sent him a splendid section, and the balloon did everything for the defenders; it not only located all the Boer guns and their

positions, but it also withdrew all the Boer fire on to the balloon. Several balloons were

Lord Roberts's Army advancing towards Johannesburg: 84th Battery and Balloon Corps.

[By kind permission of Messrs. Underwood and Underwood.

absolutely destroyed by shell fire. I do not know exactly what to say would be the most interesting moment. One of the staff officers went up, and his balloon was burst at 16,000 feet up, and came down pretty fast. That was the quickest run down they ever had from shooting. On the other side, with General Buller at Colenso and up the Tugela River, Captain Phillips' section that he raised from the remains of the second section that had gone on, did some splendid work at Spion Kop and during the two or three succeeding days before Springfontein. At Spion Kop he located the position and made it out to be absolutely impregnable—that was probably why he came away. Then, on the other side, Captain Jones's section went up with Lord Methuen on Modder River, and his observations continued every day, and I do not think there was one single day that they were not absolutely of the greatest importance. And, finally, Lord Kitchener and Field-Marshal used balloons, and the information that was thus obtained enabled them to march on to Paardeberg. And again at Paardeberg the balloon was very useful; it enabled them to locate the whole position, and Lord Kitchener never gave them any chance to get out. I believe they would have got away in the night if they had not been located in that way. There has been a great deal of controversy about that, but we know what the balloon observation was, and we know the result. Major Blake's section went to Kimberley and on to Mafeking, and there the principal observation was taken at Fourteen Streams. They worked one balloon 13 days right off, just as it was with one load of gas, and by its means were enabled to prevent the Boers from relieving Fourteen Streams. Perhaps it was the most difficult thing they had to do the whole time. The balloon was magnificently successful in every way. To my mind that exploit of keeping the balloon in the air for 13 days under the tremendous ordeal it had to go through, was, perhaps, as good as any. Again at Paardeberg the balloon, I believe, worked five days right off and was shot in several places. On the Modder River, during the whole of the campaign, the Boers always shelled the balloons; in fact, whenever they saw them they directed their fire on to them. With regard to the difficulties in ballooning, there were some things in our favour and some against us. One of the great difficulties we had to encounter was the enormous heights

Balloon Corps ready to ascend for observation.—Lord Roberts' Army advancing on Pretoria.

[By kind permission of Messrs. Underwood and Underwood.

we went over. For instance, on the march to Pretoria we had hills 6,000 feet above the

sea, and, of course, to make an observation in these hills you had to go 1,500 feet or 2,000 feet up, so that the barometrical height was hard work on the buoyancy of the balloon, because the barometrical height then become 8,000 feet—the 6,000 feet altitude above the sea level and the 2,000 feet it was necessary to go over the hills—that was about all our balloons would do with the low barometer. Eight thousand feet is a pretty good height; I believe we have sent a captive balloon in this country 9,000 feet up, but that is quite the outside. As a rule we very seldom require to go more than two or three hundred feet above the hill we want to see over, so it was a very difficult thing to prop the ballons up sometimes. I know it was at Spion Kop; it was a very difficult thing to get that balloon up.

Snapshot of a Balloon Convoy crossing a Road in South Africa, taken by W. Maxwell, of the "Standard."

It got up pretty well, and when it was up 5,000 feet, Captain Peters was shot in the cheek. Of course there are many details which interest me that perhaps would not interest you, so that I do not know quite what to say. Those pictures Mr. Bruce showed you were very good; they were taken on the march from Bloemfontein to Pretoria. This year has been marked by the number of balloons in active operation. Not only had we four sections in South Africa, but a section went to China under Colonel Macdonald, and another section which Major Trollope sent out under Mr. Speight went to the Jubilee in Australia to celebrate the anniversary. Of course the whole thing was a great strain to a certain extent on Major Trollope, who had to send everything out. As you are probably all aware we have to-day had news from the French experimental department for navigating balloons, of a very successful experiment, perhaps one of the most successful they have ever had. I do not know that there is anything further I can tell you which would be of general interest, but I shall be happy to answer any question anyone would like to ask.

The CHAIRMAN: I think, Ladies and Gentlemen, we are very much indebted to Col. Templer for having so kindly given us this brief address. I am sure it is more satisfactory to us to know that we have heard it from the lips of one who has been on the spot, and that we are not indebted to the paragraph of a newspaper which might be contradicted to-morrow. I now ask Mr. Bruce to read Mr. Lawrence Rotch's paper on The Chief Scientific Uses of Kites. Mr. Lawrence Rotch is the Director of the Blue Hill Observatory in the United States of America.

The Chief Scientific Uses of Kites.

BY A. LAWRENCE ROTCH, Director of Blue Hill Observatory, U.S.A., and Member of the International Aeronautical Committee.

If we neglect the ancient legends regarding the employment of kites in China to communicate with the garrison of a besieged town and the carrying off of a golden ornament from a tower in Japan, the earliest use of kites seems to have been in 1749, when Dr.

Alex. Wilson of the University of Glasgow in this way lifted thermometers into the summer clouds. Curiously enough, this first application of kites to meteorological purposes has proved to be the most important use to which they have been put since. Two years later Dr. Benjamin Franklin, in Philadelphia, by means of a kite, proved the identity of electricity and lightning, these experiments being afterwards repeated by De Romas in France, by Beccaria in Italy, and by Cavallo in England. Early in the last century, interest in the kite for scientific purposes was revived, and Admiral Back obtained with it temperatures above Hudson's Straits, while in 1847 Mr. W. R. Birt proposed to obtain in the free air above Kew Observatory, observations of the various meteorological elements. In Philadelphia, about 1837, the Franklin Kite Club employed kites both for scientific experiment and for amusement. Still earlier, that is to say in 1823, an Englishman named Pocock dragged a carriage by kites, and even pretended that it outstripped the stage-coaches. He also proposed to employ kites in warfare to reconnoitre; and, in fact, with a great kite did lift a lady, seated in a chair beneath, to a height of several hundred feet. Kites to carry a line from a stranded ship to the shore, or *vice versâ*, were suggested as early as 1760, and since then a score of devices of this kind have been invented, including Sir George Nares' storm-kite in 1865. Quite recently such a use of kites has been advised, but it does not appear that any successful experiments to save life with kites have been carried out.

The advent of kites into modern science may be said to have been in 1883, when Mr. E. D. Archibald, of Tunbridge-Wells, showed how to get with them all kinds of meteorological data, and actually executed important measurements of wind-velocity at various elevations by means of anemometers fastened to the kite-wire, which he used in preference to string, as being lighter, smaller, and stronger. Mr. Archibald also took a photograph of the ground from a kite; and kite-photography was further developed by MM. Batut and Wenz in France. Ten years later Major Baden-Powell, the distinguished President of the Aeronautical Society, after much experimenting, evolved a flat kite without a tail which could be folded up for transportation and yet, when several of them were coupled together, sufficed to lift a man. He thus demonstrated that for army purposes kites might often advantageously supplant balloons.

However, for the application of the kite to all sorts of purposes—some of these ideas being pure newspaper fancies—we must go to the United States. Interest in the kite there was aroused by Mr. W. A. Eddy, a journalist, who, in 1892, introduced a tailless kite, resembling the Malay kite, with which he lifted thermometers, having already advocated a scheme of forecasting the temperature from such observations. In 1885—133 years after Franklin's experiment—Mr. Alex. McAdie, using an electrometer, repeated the experiment at my observatory on Blue Hill. In 1894 the first meteorological instrument, recording its indications graphically and continuously, was there lifted by means of Eddy kites, and since that time we have carried on systematically the work of exploring the air. With these meteorographs, as they are called, which inscribe minute by minute the changes of the principal meteorological elements, a record is made at the ground and simultaneously at the known height to which it is carried by the kites. The Malay form of kite was abandoned after the cellular kite invented in 1893 by Mr. L. Hargrave, of Sydney, became known. This type of kite, that is to say a kite having pairs of two or more superposed surfaces, is now altogether used by us. The surfaces opposed to the wind are curved like a bird's wing, and the vertical component of the wind is thereby increased. A kite having 70 square feet of lifting surface weighs about 11 lbs., and costs £10 or £12. Steel wire weighing 15 lbs. per mile, capable of resisting 300 lbs. pull, is used as a flying line to which the kites are attached at intervals, and a steam-winch is employed to haul them down. The meteorograph weighs about two pounds and records the barometric pressure, the temperature and humidity of the air, and the velocity of the wind. Several hundred flights have been made at Blue Hill

during the past five years, the highest last year exceeding three miles, and the average height of all the flights for the year being above a mile and a half. To appreciate the value of such records for the progress of meteorology, it may be well to call attention to the costly efforts made for many years past to get observations in the upper air from our mountain observatories. Although these have the advantage of yielding regular observations at a constant height, yet they do not represent the conditions of the free air at an equal height. To ascertain these conditions, balloons with and without observers have been extensively employed recently in Europe, but they offer these disadvantages: The balloon being in a relative calm is greatly heated by the sun and so the temperature readings are often too high. Moreover, balloons usually rise so rapidly that the instruments have not time to take on the state of the atmospheric strata through which they pass, but more important still is the fact that as a balloon drifts with the wind, and also along with the weather itself, the observations are not comparable with the observations that are being made at the starting point. Kites possess great superiority in these respects. As they remain nearly stationary with respect to the wind, the instruments are well ventilated, and owing to the small surface of the kite, no heat radiation can affect the thermometers. The observations are made at a known height, nearly over the station on the ground; and so, by making frequent ascents and descents, the conditions prevailing in this column of air at any time can be very accurately determined. Consequently, whenever there is wind and up to altitudes of three miles or more, kites present the best and cheapest means of ascertaining the meteorological conditions of the free air. Since the work at Blue Hill has become known, the use of the kite for meteorological purposes has become international. The United States Weather Bureau undertook during the summer of 1898 to obtain daily, at a mile above 17 stations, data with which to construct a weather map for forecasting, but, unfortunately, the light winds prevented the accomplishment of the project. Kites, however, are being employed, with success, by the meteorological bureaux of France, Germany and Russia, to gather information about the varying conditions of the free air; and, as already stated, this is the most important use of kites at present. It is probable that kites could be used advantageously in allied researches, such as the determination of the electric potential of the air, the intensity of solar radiation, and the collection of samples of air at different heights for analysis.

A few other purposes to which the kite has actually been put in the United States may be mentioned. First, men have been lifted by them on several occasions. In 1897, Lieutenant Wise, of the U. S. Army, having the same object in view as Major Baden-Powell in England, in 1897, with the aid of a cord and tackle succeeded in pulling himself up to a height of forty feet, sustained by several Hargrave kites, as Mr. Hargrave had already done in Australia. The same year Mr. C. H. Lamson, of Portland, Maine, using an immense kite, with superposed surfaces aggregating 600 square feet, between which he was seated, was lifted 50 feet or more above the ground. Mr. Lamson was able to change the angle of incidence to the wind while aloft, and in this way to make practical experiments on the kite as an aeroplane, from which it appears that the kite may render important services to the development of the flying machine. Lieutenant Wise has admitted the shortcomings of the kite for reconnoitring, namely that it requires wind, and, therefore, must be accessory to a captive balloon for military purposes. For the Navy, however, it is probable that a fast vessel in motion would always be able to create sufficient wind to raise a man-lifting kite; and for ease of handling and transportation on ship-board, kites are vastly superior to balloons. It may be possible on land and in a level country, for automobiles to raise such kites, but so far, to my knowledge, these vehicles have been employed solely to pursue kites that have broken away.

For photography, kites have been employed by Messrs. Eddy and Woglom, of New York, and they have secured tolerably good pictures of the ground from an extreme height of a few hundred feet by operating the shutter of the camera by a cord. It would appear that this offers a cheap and simple method of surveying, though so far no demonstration of its accuracy has been given. In order to obtain

photographs of the upper surfaces of clouds, which we can rarely see, the writer had constructed in Paris an automatic camera, to be hung below a kite, by which he hoped to get a series of such pictures. The exposures of the sensitive film are controlled by clockwork, so as to begin only after the apparatus shall have reached the desired altitude, and to continue at intervals that are arranged beforehand. The weight of the camera (6 lbs.) precludes its being lifted as high as our meteorographs.

Kites may readily be used, always provided there is wind, to signal visually. At night this can be done by lanterns, or, possibly, by an incandescent electric light, for which the current is transmitted through the retaining wire connected with a battery at the ground. Experiments were made two years ago at Blue Hill, looking to the employment of kites to raise the terminal wires in Marconi's space-telegraphy. While from a height of 100 feet electrical signals were transmitted 12 miles, yet the atmospheric electricity collected by longer wires precluded their use. Kites have carried telephone wires over inaccessible places, such as rivers, and no doubt they may serve a useful purpose in raising lines up precipices or over high buildings, in the manner proposed for communicating with wrecked vessels.

Other applications of the kite might be mentioned, but probably enough has been said to show that the kite, at the commencement of the twentieth century, is an important engine both from a scientific and practical standpoint.

The CHAIRMAN: I think we shall all agree that we ought to tender our cordial thanks to Mr. Lawrence Rotch, Director of Blue Hill Observatory, for this very interesting paper that he has sent us, on the "Chief Scientific Uses of Kites." (Cheers.) We will next ask Mr. Patrick Alexander to read his notes on Sounding the Air by Flying Machines controlled by Hertzian Waves (illustrated by working models); next, The Hofmann Flying Machine; then Rotary Kites, and other aerial apparatus.

Sounding the Air by Flying Machines controlled by Hertizan Waves.

BY PATRICK Y. ALEXANDER.

By arrangement balloons and kites are floated from Batheaston, Berlin, Paris, St. Petersburg, Moscow, Crackau, Vienna, Munich, Strassburg, on pre-arranged days carrying self-registering instruments which record pressure, temperature, and humidity of the atmosphere. The instruments are tested with standards before leaving, and all are furnished with notices in several languages praying that the instruments may be taken care of on landing, and returned at once to their starting place; the records are then sent to headquarters for comparison.

I have here two types of instruments, one for work at low altitudes and the other for high; this type having already done good work at 14 miles high.

As the instruments, balloons and kites are subject to various mishaps, it becomes necessary to devise means whereby they can be launched from the station, sound the atmosphere, and return to the station with the records in safety.

Fortunately, in the Hertzian Waves we have a power that lends itself to control the direction of small flying machines which are furnished with their own propelling power, upon which the instruments can be slung, and if the wind is not blowing too strong, the flying machines can sound the air within a radius of 20 miles both by day or night.

They are provided with a compass that indicates their course, and with apparatus that will give their direction and distance from the station, for it may be necessary to send away instruments in a fog or by night, when they would not be visible, to ascertain the thickness of a snow cloud, to test a cloud for atmospheric electricity, etc.

The instruments having been tested and fixed and the flying machine sent up, the compass, which, in connection with automatic gear, gives the course to the station; but if it is not correct, signals are sent to the machine which actuate apparatus that instantly guides the machine until she is steering the correct course.

Selenium being sensitive to light. I have also arrangements for steering by sensitive flames and also by peculiar sounds. The chief point I claim in this system is automatic apparatus to make regular contacts and a given number every revolution of a revolving arm.

It is hoped these machines can be used for various purposes, for instance, carrying messages, exploring, and camera work, for relays, land and marine, can be arranged to control the flight of the machines, even if they are going at the rate of upwards of 1,000 miles an hour.

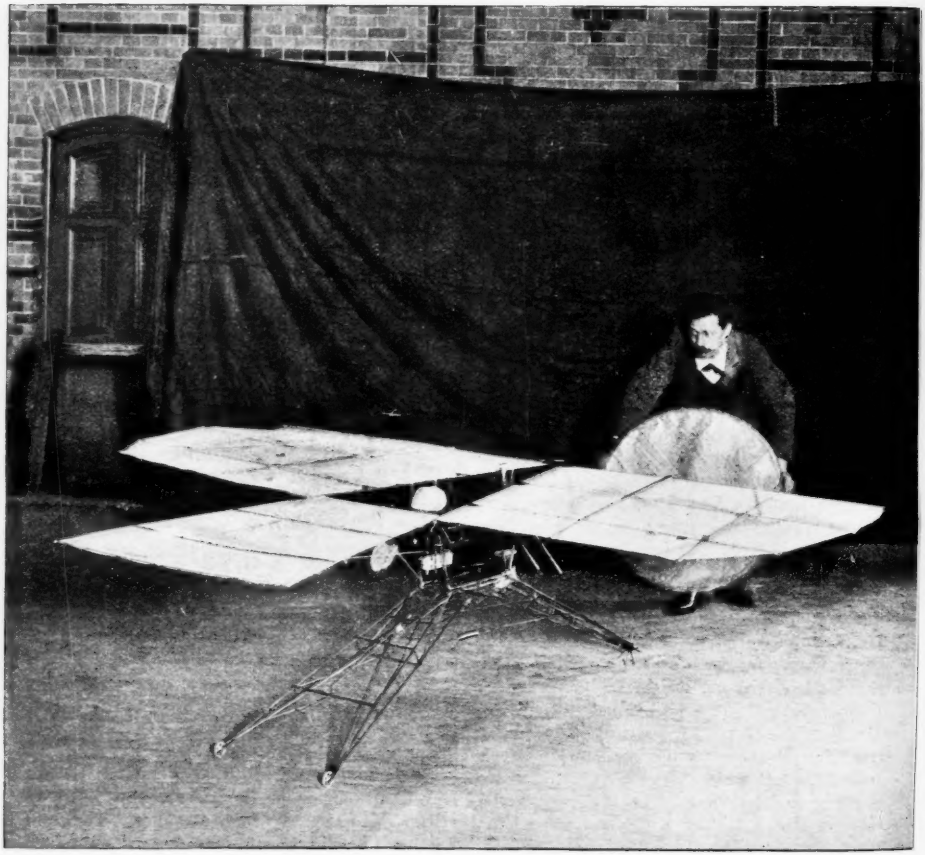
Hofman Flying Machine.

This machine is upon the aeroplane principle, driven by screws. There are two screws, or rather one double screw, which gives a turning movement to the machine; but this is equalised by automatic apparatus which balances the affair.

Rotary Kites.

Hitherto, kites have generally been constructed for simply riding on the wind; if the kites rotate a better lifting effect is anticipated, by screws turned round by the wind.

At the conclusion of his paper Mr. Alexander showed apparatus illustrating the behaviour of



The Hofman Flying Machine.

The machine is provided with legs; the arrangement is very good indeed, and enables the machine to "take off" better than running up at an incline from the grond, and on landing receives a gradual retardation or cushioning effect.

screws rotating in a horizontal plane when exposed to currents of air, also Mr. Buchanan's transverse grip propeller. This differed from the ordinary screw in as much as the blades have grooves, suitably arranged which appear to grip the air better than a plane surface.

Another exhibit was intermittent jets or currents for propulsion or reaction. These are more economical than constant currents, which seem to drive through the air without producing much reaction.

The CHAIRMAN: I am sure we are all much indebted to Mr. Alexander for the great trouble he has taken, and for the interesting experiments he has made. I have asked Mr. Alexander to allow me to examine this fan, and you will observe a number of ridges here, which as I understand him are to grip the air. Well, some time ago, I remember being informed that it had been ascertained by means of the microscope that the wings of some insects and some flies are fashioned very much on this principle; so that you see if this were turned round in the air, the air would not slip away as it would with a simple plane, but it would go by this and would therefore turn it round very much faster than it would otherwise.

Balloon Photography at Great Altitudes.

BY PERCIVAL SPENCER.

One of the most useful accessories of the modern aeronaut is the photographic camera, for, by its use, he is enabled to place before the world reproductions—meagre and inadequate it must be confessed—of the extended panoramic views and glorious visions which are ever before his lofty gaze. The Frena camera which I carry, contains forty films on celluloid, packed flat like a pack of cards, and I am enabled to expose and develop any number of these as circumstances require. The advantages of films over glass plates for balloon work are obvious, the saving of weight, the absence of danger of breakages at a breezy descent, and the very large extra number of pictures which may be taken, are all in their favour.

In photographing views on the ground, the aeronaut has to use his discretion in the selection of the subject; and, moreover, pay attention to the foreground, the middle distance, and the far distance, in order to secure a pleasing result.

To one uninitiated in photographic work, an open position with undulating hills and a view as far as the eye can reach might appear a splendid subject for a photograph, but the experienced picture-maker would avoid such a view, and select one in which the foreground and middle distance contained some object of interest.

The balloon photographer, however, has no such discretion. As soon as the balloon leaves the earth the picture becomes a distance one; he can snap one or two views at the very start, and afterwards he has distance only, the grandest view it is possible for mortal eye to see, the horizon extending for twenty miles or more, but everything in diminutive proportions.

He becomes a student of distance photography only, he studies the light and shade, and looks out for interesting features to include in his pictures, and his object is to secure interesting "bird's-eye views."

With this object in view, the most important consideration is the altitude and the clearness of the body of atmosphere through which the photograph is to be taken.

In a misty state of air one may expose a picture at a low altitude, a few hundred feet, and obtain a result, whilst at a few thousand feet the result on the film would be absolutely nil, the reason being that at the small height the picture itself reflects sufficient active light to produce the impression, whilst at the great height the mist intervening reflects the light and is photographed instead of the view on the earth. To the human eye the view may be possible, but to the eye of the camera all is blank.

In a clear air photographs are practicable as high as the balloon can ascend, and it only becomes a question as to whether any suitable subject for the purpose lies beneath. For instance, in a balloon trip across the English Channel, one may be for hours at a height of thousands of feet in sight only of the sea beneath, a very fine situation undoubtedly, and one which gives ample opportunity of speculative considerations. Where are the vast fleets of steamers which ply continually? where are the ocean-going vessels? where even the humble fishing craft? Nothing to be seen but the deserted waters for the whole range of view. Even if an occasional boat passes in sight it forms no subject for such a distant photograph, but when one crosses the shore and passes over dockyards, piers, buildings and rivers, there certainly are the subjects for snapshots from the eagle eye of the Frena. For such a subject one gives a rapid exposure, say 1-40th or 1-80th of a second, and uses a small stop to the lense, say F/32. The exact details grow on one instinctively and vary with the time of day and of year, and in the after process of developing the latent picture one gains experience for future work. To practically demonstrate this work I now show lantern slides made from my negatives.

Slides were shown of:—

1 and 2. The balloon ready to start from the Crystal Palace Grounds.

3, 4, 5, 6, 7, 8, 9. The Crystal Palace and Grounds, taken from the balloon car at varying heights, from 250 feet to 1,000 feet.

10. Charlville Circus and Sydenham, from a height of 1,000 feet.

11. Lower Sydenham and Gas Works, from 1,500 feet.

12. Honor Oak Station and Cemetery and District, from 2,000 feet.

13. The Thames and Greenwich, from 1,500 feet.

14. Greenwich Hospital, from 1,000 feet.

15. Woolwich and the Entrance to the Arsenal, from 3,000 feet.

16, 17, 18, 19. Views of Hastings and St. Leonards, when passing out to sea at a height of 9,000 feet.

20. An immense crowd of spectators at Wolverhampton, from 250 feet.

21. The City of York, with buildings, Old Wall, Bootham Bar, and Old Minster, from 1,000 feet.

22. Boulogne and Harbour, from 5,000 feet.

23. Dover Harbour, from 2,000 feet.

24. The fortified French town of Gravelines, from 5,000 feet.

In conclusion, I think these views have shown the truth of my early remarks as to the utility of the camera as an adjunct for the balloonist. The modern improvements in cameras and photographic work render the process certain and simple, and the aeronaut photographer therefore has much greater surety now than was possible but a few years since. The views which are secured, too, often show details and points of interest which may escape notice when taking the fleeting view which one is enabled to get with the human eye. These photographs, under many circumstances, may prove of use to the surveyor and military man, and all the laws in the world cannot prevent the passage in the air, thousands of feet aloft, of a balloonist with his camera, although he may be over most important strategic positions and fortifications.

It is, however, mostly as a means of increasing the interest in balloon trips and obtaining interesting records of enjoyable balloon voyages, that I hope to see my passengers, friends, and members of this Society who accompany me and my brothers aloft, armed with photographic cameras, so that they may obtain mementoes of what all balloonists know to be the most delightful experience which is possible for mankind—to soar aloft into the air in which he lives and breathes.

The CHAIRMAN: I am sure, ladies and gentlemen, that we are not only much indebted to Mr. Percival Spencer for his interesting remarks, but also it has been a great treat to us and a great privilege to see these beautiful photographs, which I venture to think very few of us have had the opportunity of seeing before. Our programme for this evening is now completed, and I have only just a few words to add. We have all heard and read recently of the ascents made in France by M. Santos Dumont, and it has been reported in so many papers that no doubt you have read the particulars. I wish just to add this: whilst we may give M. Santos Dumont every credit for his perseverance and ingenuity, and hope that he will obtain the prize of 100,000 francs (£4,000), we know that it is only in the case of very calm weather that such a feat as he has performed is possible, etc.

We may say that our pleasant entertainment is concluded, and we have to thank you very much for your kind attention and for your presence here.

Mr. E. P. Frost: Ladies and Gentlemen,—I am sure we all feel deeply indebted to the gentleman who has so ably officiated in the Chair. I would, therefore, propose a vote of thanks to Major Roberts.

Col. TEMPLER: I beg to second that.

The vote of thanks having been carried by acclamation,

The CHAIRMAN said: I beg to thank you, ladies and gentlemen, for your kind vote of thanks.

The proceedings then terminated.

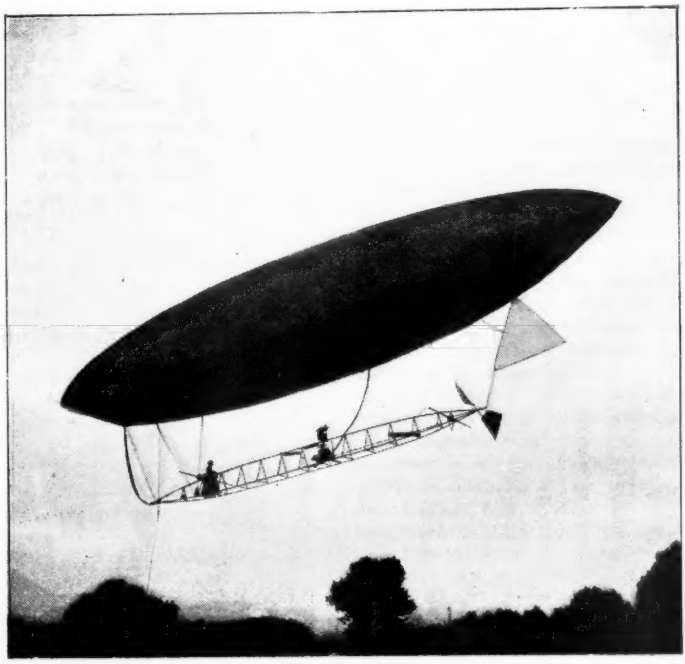
M. Santos Dumont's Navigable Balloon.

If M. Santos Dumont has not yet contrived to navigate his airship against a wind of any great dimensions, he has by pluck, determination and perseverance, succeeded in drawing the attention of the whole world to aerial navigation, and stimulating a greater interest in the problem than has ever before been aroused. Previous inventors of navigable balloons, though they have spent thousands on their constructions and have received sufficient encouragement in the success of their initial experiments to justify further

expenditure of their time and money, have suddenly stopped short in their investigations, some for want of further funds, others, no doubt, for want of the rare but necessary virtue of perseverance. Its possession by M. Santos Dumont is shown by his resolution to use failures as stepping stones to success. To him hitches and accidents have hitherto been pregnant with suggestion for further improvement. During the past four years he has evolved no less than six airships, each succeeding type embodying steps of progress evolved from practical experiment. The whole scientific world must have congratulated the young Brazilian aeronaut on his escape from injury on the occasion of the three accidents which have recently befallen his airship; but while it is confidently hoped by all aerial experts that in the interests of aeronautics he will continue his experiments, it will be the wish of his friends that he will allow prudence to accompany bravery and perseverance, and not unduly risk a life that promises to be of such value to the cause of aeronautics.

The details of M. Santos Dumont's experiments and accidents have been very ably treated in articles in the *Times* and other daily papers, and especially graphically in a series of articles in the *New York Herald*, including some accounts written by M. E. Aimé, and to which we would specially refer our readers.

Concerning the experiments in July last, M. de Fonvielle, the late President of the French Aeronautical Society, has contributed a communication to the Aeronautical Society of Great Britain.



M. Santos Dumont's Navigable Balloon.

[By kind permission of the "Illustrated Mail."

COMMUNICATION BY M. DE FONVIELLE.

"I think it is my duty to write on behalf of the Aeronautical Society my impression of this grand experiment. The results obtained must be attributed to several causes which it is important to relate singly. The elongated balloon has invariably kept its form because it is connected with a ballonet inflated automatically by a ventilator worked by the engine. The envelope is connected with the

frame by an immense number of vertical steel wires which forms a solid mass travelling in the air. The immense helix is four metres in diameter, and is worked by an engine of 16-horse power. A powerful system of ventilation prevents the over-heating of the engine. In itself, the rudder has nothing worthy of notice, and could be replaced by any lateral sail or resistance.

The intelligent and happy use of the ventilator is deserving of praise. It is quite a new feature in the experiments, and is opening a fruitful way to the aerial art. It dispenses with the cumbersome and heavy Zeppelin aluminium wire cage. The working of the apparatus for putting the engine into operation was imperfect, and to its faulty condition may be attributed the final collapse. The petroleum engine with its four cylinders is also too complex and too easily put out of order. But these faults are after all trivial, and do not diminish the value of the teachings of the new construction as a whole. It must be said that M. Dumont has paved the way of the clouds and given wings to the petroleum engine. The new dirigeable balloon is not a perfect one, but it has done a great deal more with its 550 cubic meters of hydrogen than Count Zeppelin's with its 11,000."

Since M. de Fonvielle wrote this communication three accidents have befallen M. Santos Dumont, the news of the last coming to hand while the writer is preparing this article.

The accident of M. Santos Dumont on August 8th, when he fell a distance of no less than 2,000 feet on to the roof of the Trocadéro Hotel, shows the importance of the cigar-shaped balloon keeping its envelope in a rigid condition. On this occasion the apparatus which supplied the ballonet with air for the purpose of maintaining its rigidity did not act, and experts may ask whether this system of pumping air into an inner balloon for the purpose of maintaining the rigidity is sufficiently simple to ensure its maintenance, and whether there was not reason in the provision by Count Zeppelin of a rigid light framework? Possibly the accidents sustained by the intrepid Brazilian aeronaut may have led M. de Fonvielle to modify his views on this point; and it is hoped he will send a further communication for the next number of the "Aeronautical Journal" concerning the latter experiments. From the accident of Sept. 6th it would appear that M. Santos Dumont's No. VI. balloon did not retain the hydrogen as well as could be desired; and this accident emphasizes the want of a gas-proof varnish. Now that there is activity in balloon engineering, is there no chemist that will give this urgent aeronautical need his attention. It is surely within the powers of chemistry to improve upon the faulty varnishes which are used in balloon manufacture. It was this want which, doubtless, first led the British Government balloon experts to employ goldbeaters' skin for the balloon envelope. The expense of goldbeaters' skin, will, however, always be a hindrance to its general adoption.

It is frequently asked how far M. Santos Dumont has, by his experiments, advanced the art of aerial navigation. It does not appear that he has navigated his balloon against more than very light winds; but in his machinery he has shown such attention to detail that it may reasonably be expected that if he continues to increase his motive power he will ere long exceed past performances.

The Sparrow Balloon Coin.

We are indebted to the courtesy of Miss Agness Buttress and the Keeper of Coins at the British Museum for the representation of the Sparrow Balloon Coin herewith presented.

The Sparrow Balloon Coin.

(Reproduced by kind permission of the Keeper of the Coin Department, British Museum.)

Miss Agness Buttress writes as follows: "About the end of last May I was digging in my garden to plant a shrub, and turned up what I thought at first was the shank of an old button; but being somewhat observant by nature, I rubbed the earth off and examined the coin under a glass; I then polished it a little with metal paste, thinking it was silver, and could read the words. The terrace I reside in is situated at the base of Highgate Hill, North London, and the houses have been built more than 60 years."

The writer of this letter was kind enough to lend the Honorary Secretary of the Aeronautical Society the coin described above, and which is represented by Nos. 3 and 4 in the illustration. As will be seen, on one side of the coin is the representation of a pear-shaped balloon with two passengers in the car and bearing on it the word "Sparrow." Round the engraving of the balloon are the words "Ascended at Oxford, June 23rd, 1823." On the other side is the representation of a man in an old-fashioned coat and wearing a cap with peak. Round this are the words "Ironmonger, Bishopsgate, London."

In the attempt to throw light on the balloon ascent made by this enterprising ironmonger, the editor of this journal paid a visit to the Keeper of Coins at the British Museum, and found that the coin department of the Museum not only possessed a sample of the coin found by Miss Agness Buttress in her garden, but also others which had been evidently struck by the ironmonger aeronaut, and which bore somewhat dissimilar impressions. 1 and 3 represent the impressions on each side of one; of these, 1 gives the full name of the ironmonger—Isaac Earlyman Sparrow; 2 shows another representation of the balloon, slightly differing from No. 4. Nos. 5 and 6 show that Mr. Sparrow evidently used these coins as means of advertisement, for on one side of this coin appear the words "Sparrow's Leather Sauce," while on the other, round the balloon, are the words, "Sparrow, nail merchant, London." The balloon is, again, of a different shape, being more spherical in this case. These three representations of the balloon would seem in each case to be from the pen of different draughtsmen. In order that these various specimens should be represented in the "Aeronautical Journal," the Keeper of Coins in the British Museum very kindly ordered plaster casts to be made of each specimen, and gave permission for their reproduction.

In further pursuit of information concerning the ascent of Mr. Sparrow, the editor of this journal paid a visit to Oxford and consulted the pages of "Jackson's Oxford Journal" for 1823. It may be remarked that this latter journal is one of the oldest-established newspapers in the kingdom, this being the one hundred and forty-ninth year of its issue.

From the search, it was ascertained that this balloon ascent was really made on June 13th, 1823, from the Oxford Gas Works in Commemoration week, and that Mr. Sparrow accompanied the famous aeronaut, Mr. Green, to whom the balloon belonged. As the date on the coin found by Miss Agness Buttress is June 23rd, 1823, it would seem that this date is the one on which the coin was struck.

Permission has been obtained for quoting the following extracts from "Jackson's Oxford Journal," giving details concerning his ascent.

Extract from "Jackson's Oxford Journal," June 14th, 1823:—

"The entertainment carved out for yesterday was the ascent of Mr. Green in his balloon; and so powerfully attractive was the spectacle that from an early hour every road leading to Oxford was an unbroken stream of pedestrians, horsemen, and carriages of all constructions; and as the morning advanced, the whole population of the neighbourhood seemed to have emptied itself into our streets.

"The ascent of the balloon was delayed for more than two hours, from an accident that happened to one of the poles at the commencement of the arrangements; but about half-past two, the inflation being completed, Mr. Green mounted the car accompanied by a gentleman of the name of Sparrow, of London. Nothing could exceed the intrepid self-possession of both of them. The beautiful and majestic vehicle rose with extreme slowness, and Mr. Green immediately threw out part of his ballast, but not with entire effect, for the ascent was still so gradual, that part of the net-work encircling the balloon caught the corner of the chimney of one of the buildings of the gas works, and the jerk given in consequence to the whole apparatus of the balloon was so strong that the car was very nearly upset, and at the same moment a sensation of horror came across the feelings of everyone of the many thousands who were near enough to observe what had taken place. Fortunately, however, both the aeronauts kept their seats; and instantly Mr. Green's companion with consummate address waved his flag gaily and frequently in token that the car had recovered its balance, and that all danger on that score had passed away. The balloon took a south-easterly direction, and at

a quarter before six the intrepid aeronauts descended in the park of Lady Stapleton, at Rothafield Grays, near Henley, having been up three hours. The descent was accomplished without any accident to the voyagers and the balloon, but it appears not without considerable difficulty. At twelve o'clock last night Mr. Green and his companion arrived in the city with the balloon in perfect safety."

Extract from Jackson's Oxford Journal, June 21st, 1823, being the narrative of Mr. Sparrow, the young gentleman who accompanied Mr. Green on his aerial voyage from Oxford on June 14th, 1823.

"On rising from the ground it appeared as if we were impelled upwards, not unlike the feeling excited by the action of a swing. The concussion when the car struck the chimney of the gas works was electric, and gave the car a vertical movement. On clearing this obstruction we took an oblique direction inclining to S.W., when a light current of air springing up we again changed for due east, and rose perpendicularly and rapid from the quantity of ballast we had thrown out to clear the gas works. It is not in the power of language to express the gratification the aeronaut experienced on viewing the expanse about him into which he was gradually and almost imperceptibly rising. At about half a mile from the earth, a variety of currents were encountered, which produced a retrograde and sometimes angular motion. To avoid any sensation of fear from looking too suddenly down on the objects beneath, the young aeronaut accustomed himself to the view by gradually taking the more distant object first, and in a short time he was able to look with the greatest confidence on the surface of the earth, which at that time presented the most beautiful variety of colours resembling a mosaic pavement heightened by the sun's reflection. Around them the clouds appeared in oceans of snow, beneath the splendid carpet of Nature spread forth her gay varieties over an immeasurable expanse. The accident at starting had injured the barometer, but not so as to prevent their calculating the heights. On leaving the earth, the mercury stood at 29 inches 7-10ths. At the greatest altitude to which they rose it was at 21 inches 3-10ths. From this they calculate they were above two miles from the surface of the earth. The thermometer fluctuated greatly, the lowest point was 55, the highest 70. As the barometer would not answer to the descent they had recourse to an expedient by placing one of the flags over the side of the car, and observing the action of the air upon it; by this means they ascertained when they were descending or rising. When they had been in the air one hour and a half, the cap of the neck of the balloon came off, and as they were compelled to stand up and tie a silk handkerchief round by which means they succeeded in preventing the too rapid escape of the gas, nothing material occurred for the next hour and a half until they began to descend. Mr. Green conceived they hovered over Nettlebed Heath where the woods are unusually thick. They had now little ballast left, and, therefore, no choice of selecting a more favourable spot; they continued to descend rapidly, and at about a thousand feet from the earth Mr. Green gave his companion instructions to throw out the cushions and cling fast to the hoop from which the car was suspended to the balloon. They had scarcely done so before they experienced a most violent concussion from the machine striking the earth and rebounding a height of 50 feet. It then rose and passed a few yards, when, on a second descent and shock, Mr. Sparrow was thrown out, and the balloon thus lightened, rose again with Mr. Green. At about a distance of 150 yards, Mr. Sparrow having recovered from the shock and caught hold of the ropes, the netting and car became entangled in the tops of some very high trees. In this perilous situation immediate assistance was offered by the labourers in Lady Stapleton's Park, where they had first fallen upon a rising ground, and within 300 yards from the Mansion House. Stapleton Park is two miles from Henley and 22 from Oxford. The balloon was, by the exertion of a dozen strong fellows, soon secured, and Mr. Green descended down the rope to terra firma. The car was dashed to pieces by the violence of the shock. Lady Stapleton instantly sent and invited the aeronauts to partake of some refreshments, and offered them every assistance in securing and conveying the balloon to Oxford, where they arrived about 12 o'clock on Friday night.

Possibly some of the readers of the Aeronautical Journal may be able to send other particulars of the aeronautical career of Mr. Sparrow. From the fact that each of the coins are differently engraved and that the shape of the balloon is different on each, it may reasonably be assumed that they each memorialize different ascents.

Reviews.

Aerial Navigation—Balloons and Flying Machines from an engineering standpoint, by Octave Chanute. Cassier's Magazine (June, 1901), London.

At the present moment when the efforts of M. Santos Dumont have attracted so much general attention to aerial navigation, Mr. Octave Chanute's excellent summary of progress in aerial engineering in Cassier's Magazine will be especially welcome to that section of the public who wish to obtain a bird's-eye view of the subject.

In the article he very clearly treats of the performances of the navigable balloons and flying machines that have as yet been devised.

Concerning the experiments of Count Zeppelin, Mr. Chanute is of opinion that he would have obtained better results if he had imitated the fusiform shape of the French balloon of 1885. "The resistance of this was given by Renard as $R = 0.01685\ D^2\ V^2$ in metric units, and amounts to $R = 0.0006876\ D^2\ V^2$ in British units, in which D is the diameter of the balloon in feet; V the speed in miles per hour; and R the resulting resistance in pounds. This amounts to 18 per cent. of that of a thin plane equal to the largest cross-section in area.

Zeppelin having obtained a speed of 18 miles an hour, as stated by himself, the resistance of his ship is

$$\frac{32 \text{ H.P.} \times 375}{18} = 667 \text{ pounds.}$$

which is 34 per cent. of that of a disc 39 feet in diameter with a pressure of 1.62 pounds to the square foot; this pressure being that due to the speed. The equation for his airship is therefore, $R = 0001353\ D^2\ V^2$ in British units, but he might have attained about 22 miles an hour had his shape been the same as that of Renard; and still more had it been that of a fish, say a salmon."

The recent experiments of M. Santos Dumont have taken place since Mr. Chanute's article was written; therefore, we have not yet Mr. Chanute's opinion of these; he merely mentions M. Santos Dumont's earlier experiments without criticism.

Speaking of the possibilities of navigable balloons in the future, he points out that "the size must be great, even to the verge of impracticability, the form must be that of least resistance, and the length should not be more than ten times the diameter in order to ensure stability. Moreover, the propeller must be effective and preferably at the front, and the motor, including its supplies, should develop great power in proportion to its weight. If all these conditions be observed, the French experts allow that the ultimate speed may attain 44 miles an hour in the distant future. This is about the speed with which motor-driven flying machines will begin.

Regarding flying machines, Mr. Chanute considers that the best that has been done has been to sustain from 27 to 55 pounds per horse power by impact upon the air. "Gliding machines, it is true, using gravity as a motive power, show 89 to 110 pounds sustained per horse power, but these figures must be considerably reduced when an artificial motor is substituted in order to cover the inevitable mechanical losses in the machinery and in the propeller. Much has been done within the past decade towards reducing the weight of motors. Steam engines have been produced weighing but 10 pounds per horse power, and the latest gasoline motor, that of Buchet, is said to weigh only 12½ pounds per H.P.; but much remains to be done to render machines working so nearly up to the limit of endurance absolutely reliable and safe in the air. It now seems probable that the successful aerial motor will be some form of gasoline engine using air instead of water as a working fluid, and thus saving weight."

One of the most important points about flying machines is, in Mr. Chanute's opinion, the maintenance of equilibrium. On this subject he is, perhaps, the greatest living authority, as he has devoted so much attention to the subject of soaring machines. After the disastrous termination of the ascents of both Lilienthal and Pilcher, it is satisfactory to hear that Mr. Chanute has had about one thousand slides made by assistants, with two different types (5 machines) without the slightest accident.

Concerning the methods of obtaining equilibrium he says, "The underlying principle of maintaining equilibrium in the air is that the centre of pressure upon the sustaining surfaces shall at all times be upon the same vertical lines as the centre of gravity, due to the weight of the apparatus. In calm air this is fairly secured, but in a wind the centre of pressure is constantly shifted by the turmoils of the air, for it advances or recedes with the diminution or increase of the angle of incidence. There are several ways of counteracting this difficulty. The centre of gravity may be shifted back or forward to coincide again with the vertical line passing through the new centre of pressure; this is the method employed by Lilienthal and by

Pilcher, which they applied by shifting the position of their personal weight. Or the centre of pressure may be brought back into a vertical line with a fixed centre of gravity either by changing the angle of incidence, or by shifting the surfaces themselves. These latter are the methods which have been experimented upon by the writer in three different ways:—

"1. Affixing a horizontal tail (the Penaud tail) at an angle to the supporting surfaces. This catches the air on its upper or lower surface, and shifts the angle of incidence of the wings, and, consequently, the centre of pressure.

"2. Pivoting the wings at their roots so as to move horizontally. These are arranged so that the impact of the air shall bring them back into the proper position.

"3. Pivoting the surfaces so as to rock vertically. This is arranged so that the impinging air shall automatically shift the angle of incidence, and, therefore, the centre of pressure.

"The third arrangement is believed to be the best, but one cannot be sure, inasmuch as all the adjustments above indicated are most delicate. Simple as the principles seem to be, it requires years of experiment to apply them properly. The positions of the pivots, the strength and adjustments of restraining springs, and the best position for the centre of gravity involve thousands of cut-and-try experiments, first with models and then with full-sized gliding machines carrying a man."

Meetings of the Permanent International Aeronautical Commission.

TRANSLATED BY H. A. B.

At this meeting of the Permanent International Aeronautical Commission, a report, by M. Hervé, was read on the method of publishing the work of the Committee; also a statement by Chevalier Pesce on the presentation of the reports of the delegates of the Permanent Commission at the late International Maritime Congress at Monaco. The Commission adopted Colonel Renard's proposal to approach the Life-Saving Societies with the object of realising its proposals for maritime aerial life-saving apparatus, and of starting preliminary experiments. The Commission calls upon its delegates at the Monaco Congress to complete their work by a practical assent.

Owing to incomplete accounts of its last communication, the Committee considers it advisable to again point out the permanently advantageous nature of the facilities it has obtained for the free return carriage of a balloon fallen in a strange country, by the presentation of a certificate of origin guaranteed by the maker and viséd once for all by the commission.

June 27.

At this sitting, Naval Lieutenant Sapissier, on behalf of M. Ch. Ed. Guillaume, President of the Sub-Committee of "Balloon Bearings," in relating the work of the Sub-Committee, summed up a memorandum from M. Favé, hydrographic engineer-in-chief, on a series of magnetic and astronomical observations from which he deduces a method of taking bearings which promises safety to aeronauts from their principal danger, that of drifting unbeknown to sea when at great altitudes above the clouds.

To enable aeronauts to recognise their whereabouts when approaching the earth, the sub-commission, at the suggestion of Comte de la Valette, is considering the bringing out of a species of dictionary, whose data will be figure-types characteristic of the aerial aspect of the earth's surface. This work will be linked later on to the aeronautical charts which the sub-committee will subsequently prepare.

NOTES.

Dr. Berson's Recent High Ascent.—On July 31st Dr. Berson and Dr. Süring made an ascent from Berlin, and reached a height of over 34,400 ft., thus beating the previous registered records of the height reached in a balloon, though, as in the case of the ascent of Glaisher and Coxwell in 1862, the extreme height attained is not registered as both aeronauts lost consciousness. The minimum temperature registered was minus 40 degrees centigrade. The *Daily Mail* of August 3rd gives some very interesting details concerning the ascent. At 800 feet below the highest point registered, the aeronauts became unconscious and remained in this state three-quarters of an hour. At a height

of 3,280 feet the cries of geese and cattle were still heard, and the sound of a railway engine was audible up to 20,000 feet. After this point there was perfect silence. Freezing point was reached at a height of 12,400 feet, at 20,000 feet furs were put on, and at 30,000 feet the aeronauts resorted to inhalation of pure oxygen. Concerning the inhalation of oxygen there is probably some reason in the opinion of M. de Fonvielle, given in his address to the Aeronautical Society of Great Britain in April last when he urged the importance of inhaling pure oxygen at the first feelings of inconvenience in high ascents, and not waiting until the verge of insensibility. Possibly, if Dr. Berson and his companion, in the recent ascent, had commenced the inhalation sooner, they would not have become unconscious.

The Systematic Exploration of the Atmosphere at Sea by Means of Kites.—Hitherto, the one disadvantage connected with meteorological observations by means of kites has been the impossibility of working them in winds less than 12 miles per hour. Mr. Lawrence Rotch has lately carried out experiments with kites at sea, which have proved the possibility of flying them from board a vessel in calm weather. The method not only permits kites to be flown in anti-cyclonic conditions, but enables data to be obtained a mile or two above the oceans where no observations have been possible hitherto. Mr. Lawrence Rotch brought this important step in the progress of scientific kite flying before the last meeting of the British Association at Glasgow; and, owing to his courtesy, we are enabled to quote the following extract from the abstract of his paper.

The method consists in installing the kites and apparatus on board a steamship, which, when travelling through calm air at a speed of 10 or 12 knots per hour, enables the kites and instruments to be raised to the height that could be reached in the most favourable wind. Should the wind be too strong, its force may be moderated by steaming with it. In this way the kites can be flown at all times and in these equatorial regions where a knowledge of the conditions of the upper atmosphere is needed to complete our theories of the atmospheric circulation.

The use of kites to the best advantage requires a vessel that can be manœuvred at will; and, therefore, experiments were made in Massachusetts Bay on a tug having a maximum speed of 10 miles an hour. Although the wind blew only 6 to 10 miles an hour, and at no time was strong enough to lift the kites, yet by steaming towards it within 45° of its mean direction, the meteorograph was raised to a height of half a mile. The ease with which the kites were launched and the steadiness with which they flew in the uniform artificial wind were noticeable. A trial of the kites was next made upon a passenger steamer crossing the North Atlantic, in order to ascertain whether it was possible to obtain in this way meteorological data frequently during the voyage. Flights were made on five days, when, although the winds accompanying an anti-cyclone were too light to lift the kites, the artificial wind, caused by the eastward motion of the vessel at a speed of 15 knots, sufficed to carry the kites and meteorograph to a maximum height of one-third of a mile. Had it been possible to alter the course of the vessel the kites could have been flown every day. The kite records obtained in this anti-cyclone, in connection with similar ones on deck, show abnormal changes of temperature with altitude above the ocean, great fluctuations in relative humidity, and slight variations in wind velocity. A series of such flights on successive voyages would disclose any difference in the vertical distribution of the meteorological elements above the ocean as compared with that over the land, and in weather conditions like the above, would furnish data for the upper air that cannot be obtained with kites at a fixed station.

New Airships.—Besides the large airship which is to be constructed by Dr. Barton, there are two patterns of airships being constructed in this country which are both destined to compete for the coveted Deutsch prize.

1. Mr. F. Buchanan's airship.—In the *Graphic* of Sept. 14th will be found a picture of this airship and some details as to its construction. It is shaped like a fish with the exception of a bird's head in front. Its length is to be from 80 to 100 feet. A special novel feature is that the cabin and the propellers will be inside the balloon, which is divided into an upper and lower portion. The upper portion is to be filled with gas and will contain 45,000 feet, just sufficient to balance the weight of the apparatus, divided into three compartments. The fore and aft compartments will be used simply as air chambers to fill out the shape of the fish balloon. The central chamber will be the cabin, engine-house, etc. This will be provided with a door

at the side and portholes giving a view fore and aft; and from its sides will project the two propellers. Each blade of the propellers will be about five feet long by three in width, and a very important feature of the propellers is that they are to be covered with minute grooves running diagonally outwards. These grooves are said to increase the grip of the propellers on the air, and to give a much greater thrust. Like the other recently-constructed airship oil motors will supply the power.

2. Mr. W. Beedle's Airship.—In *Black and White* for Sept. 14th will be found a picture of this aerial craft. This is to be 100 feet long and 16 feet in diameter. It is constructed to carry two men, and will be driven by a 28-h.p. air-cooled motor with four cylinders. The balloon is to contain five gas compartments and is encircled with six aluminium hoops being further strengthened by three horizontal lengths of steel tubing each measuring 80 feet. The tubing will impart rigidity to the gas holder and carry fans, motor, and car. The balloon has a capacity of 18,000 cubic feet, and when filled with hydrogen gas will lift a dead weight of 1,260 lbs. Besides the propellers for controlling the horizontal motion there is one for controlling the vertical movements without loss of gas or ballast. The completion of these two airships and their trials will certainly be awaited with no little interest.

The Balloon Voyage Across the Channel from the French Side.—On September 21st, M. George Latruffe, the French aeronaut, succeeded in crossing the Channel from the French side. He ascended at Dunkirk at 1.45 on Saturday in the balloon La Patrie. He was carried to the north-east coast of Essex, whence he was driven back to the mouth of the Thames. He again went north, and not far from Burnham-on-Crouch, his jib broke away. He then made the descent about half a mile from Southminster Railway Station.

During this voyage it appears that at one time the balloon descended so near the water that the aeronaut was able to speak to a passing steamer; but apparently no one on board could speak French, and so no reply back was received.

The Dust Floating above London.—The Rev. J. M. Bacon, in the course of his balloon ascents this summer, made an interesting observation concerning the composition of the dust floating above London. He found that it is composed chiefly of "minute fibrous particles, similar to those produced by the wear of cloth fabric." In connection with these observations, the *Morning Post* points out that the lungs of London birds are often found to be clogged with wool and glue, while those of country birds are entirely free from such impediments to respiration.

The Deutsch Prize.—At the sitting of the Aerostation Committee of the Aero-Club, on September 7th, Mr. Deutsch called the attention of the Committee to the advisability of specifying the conditions under which the competition for the Grand Prize of the Aero-Club will take place. The Committee decided that henceforth every competitor must not only return to his starting point within thirty minutes after having doubled the Eiffel Tower, but must also touch ground within the enclosure of the Park of the Aero-Club.

The time of the trial will begin from the moment when the guide rope or any cord holding the balloon is loosened. It will end when the rope is seized by a man stationed in the enclosure. After a full discussion it was decided that the notices must reach the members of the Committee, at the latest, during the evening of the day preceding the trials.

Five members at least of the Committee must be present at the ascent; otherwise the duration of the aerial flight cannot be properly verified.

The Committee will take measures for having a watch set on the Eiffel Tower, so as to be sure that it has been really doubled as the programme requires.

Foreign Aeronautical Periodicals.

On this list a selection of some of the most notable articles is given.

L'AÉRONAUTE (Paris).

June, 1901.—Note Concernant la Construction d'un Cerf-Volant pour Recherches Scientifiques, Explorations Atmospheriques et Relevés Photographiques. Par F. J. Pillet.

L'AÉROPHILE (Paris).

July, 1901.—Portraits d'Aéronautes Contemporains: Etienne Giraud (Emmanuel Aimé); Robert Lebaudy; Pour Revenir, (Robert Lebaudy); Le Concours Aéronautique de Bordeaux (Alexandre Sallé); Au Concours de Ballons de Bordeaux; L'Aviateur Roze; Atterrissage dans Paris (Comte Henry de la Vaulx); Bulletin Officiel de L'Aéro-Club.

July, 1901.—Portraits d'Aéronautes Contemporains: François Peyrey (Emmanuel Aimé); Congrès et Commission Internationale d'Aéronautique (G. L. Pesce); Le Droit d'Atterrir (Georges Bans); La Traversée de la Méditerranée (Georges Blanchet); 28 Juillet, 1901, La Neige (R. Binet); Epilogue de L'Epopée d'Andrée (G. B.); Nécrologie: François Jouffryon; George Falize (Wilfrid de Fonvielle); A 10,300 Mètres (G. Géo); Commission Permanente d'Aéronautique (Henri Hervé); Expériences d'Aérostation Militaire aux Tuileries; Une Fête d'Aéronautes (Georges Bans); Bulletin Officiel de L'Aéro-Club.

REVUE AMPÈRE.

July, August, September, 1901.—La Direction des Ballons (Emmanuel Aimé).

L'AUTO-VELO.

September 7th, 1901.—Concours l'Appareils d'Aviation plus lourds que l'Air.—La Sortie du Santos Dumont, No. 6.

ILLUSTRIRTE AËRONAUTISCHE MITTHEILUNGEN (Strassburg).

July, 1901.—Theoretische Grundlagen der Ballonfuhrung, Dr. R. Emden.—Die Zivil- und Strafrechtliche Haftung des Luftschiffers, Dr. Georg Rosenberg.—Eine Landung im Gebirge, Franz Linke-Schichtbildungen in der Atmosphäre, Dr. R. Süring.—Flugtechnik und Zeppelin's Flugschiff, H. W. L. Moedebeck.—Der Flugwagen, J. Tarnowski.

Notable Articles.

During the last three months hundreds of articles have appeared in the daily and weekly papers on the subject of aerial navigation. It is impossible to give a complete list of these, as it would fill some pages of the journal, therefore a selection of articles of interest has been made for this list.

July *Review of Reviews.*—"Air-Ships."

15. *Morning Post.*—"The Navigable Air-Ship—Official Trial."
New York Herald.—"Santos Dumont Fails to Win the Deutsch Prize."

19. *English Mechanic.*—"The Balloon in Warfare."

20. *Illustrated Mail.*—"The Conquest of the Air."
Daily News.—"Santos Dumont's Balloon." Views of the Aeronautical Society.

31. *New York Herald.*—"Worries of an Aeronaut."

Aug. 9. *Daily Express.*—"Santos Dumont's Fearful Flight."

10. *New York Herald.*—"The Santos Dumont" No. 6.

17 *Navy and Army Illustrated.*—"Air-Ships Up to Date."
The King.—"M. Santos Dumont and His Air-Ship."
Sphere.—"A Twin Balloon."
New York Herald.—"Aero-Club of Vienna."

31. *New York Herald.*—"Lath Frame Air-Ship."
Sphere.—"A Night Journey Across London by Balloon."

Sept. 6. *Daily Telegraph.*—"A Spin in Mid Air."

20. *Times.*—"M. Santos Dumont's Balloon."
Public Opinion.—"The Rise of the Balloon."
Morning Post.—"Swiss Autumn Manœuvres: The New Balloon."

21. *New York Herald.* "Oversea Ballooning."
New York Herald. "A Perilous Voyage."

Applications for Patents.

(*July, August, and September*, 1901.)

This list is Compiled by Messrs. BROMHEAD & Co., 33, Cannon Street, London, E.C.

14,311. July 13. MANUEL VASSEUR and WILLIAM EVANS. Improvements in the Mode of Propelling and Directing Air-Ships.

15,960. August 8. WALDEMAR PORAK. Improvements in Flying Machines.

16,100. August 10. WALTER JAMES GRIFFITHS. An Improved Apparatus for Navigating the Air.

16,348. August 14. JAMES BLYGH WAYNMAN MAUNDER and ALEXANDER SCHANSCHIEFF. Improvements in Air-Ships.

16,856. August 22. THOMAS MOY. Improvements in and Relating to Appliances for Effecting Aerial Navigation.

16,857. August 22. THOMAS MOY. Improvements in Means and Appliances for Securing Horizontal Stability in Aerial and Submarine Vessels.

17,151. August 27. EDWARD MALLCOTT RICHARDSON. A New or Improved Navigable Balloon or Flying Machine.

17,234. August 28. WILLIAM BEEDLE. A Steerable Air-Ship.

17,369. August 30. ARTHUR CONRAN BLOOMFIELD. Attachments for the Automatic Closing of an Umbrella-shaped Messenger Travelling on the String of a Flying Kite or Balloon.

17,426. August 30. WILLIAM THORNTON. An Improved Aerial Ship or Flying Machine

17,719. (Date applied for under Patent Act, 1883, February 6, 1901.) CARLOS DE ROSTAING LISBOA. Improvements in Air-Ships.

17,966. September 9. JAMES JONES and CHARLES FRANCIS JONES. Apparatus for Propelling and Steering Aeronautical Machines.

17,984. September 9. RAOUL TURR. Improvements in Balloons.